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TMC SPECIFICATION NO. S-260

TITLE: TEST & ALIGNMENT PROCEDURE FOR MODEL GPR RCVR. JOB 297

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1. Check B⁺ line for shorts to ground. (both +250 v and +150 lines)
2. Turn set on and measure B⁺ (should be +250v.d.c. and +150 v/d.c.)
3. Connect a 600 Ω resistor across the 600 Ω winding of the output transformer. Measure the hum level across this resistor with a high impedance A.C.V.T.V.M. for the following conditions: (Hum should measure under 0.03 v.r.m.s. across 600Ω)
 SSB Switch on OFF position. AUDIO GAIN control - full on.

	<u>RADIO</u>	<u>PHONO</u>
AUDIO SEL. SW. IN	NORMAL	NORMAL
" " " "	LO-PASS	LO-PASS
" " " "	1200cps (NAR.)	1200 cps

4. Audio Amplifier Gain Measurements: Feed a 1000 cps signal from an audio (HP200C) oscillator into the PHONO input jack (RADIO-PHONO SWITCH in PHONO position) AUDIO GAIN control should be completely clockwise. Measure the input voltage which will produce an output voltage of 34.6 v. rms. on an A.C. VTVM across the 600 Ω load resistance.

	<u>Input for 34.6 v. output</u>	
AUDIO SEL. SW. IN	NORMAL	0.3 v. rms
" " " "	LO-PASS	0.3 v. rms
" " " "	1200 cps	0.18 v. rms (audio freq. adj. for max. output)

5. Distortion Measurement: With AUDIO SEL. SW. in NORMAL position measure the 1 kc distortion at 2 watts output (34.6 v. rms across 600 Ω) with the B&W Distortion Analyzer Model 400. (should be less than 4% from 0db to 2watts output).
6. Audio Amplifier Frequency Response: Check a few points on each of the AUDIO SEL. SW. positions response curves. (Compare against Standard A.F. Curves)

SWITCHES (A)
 AVC-OFF
 N.L.-OFF
 S.R.-REC.
 BFO-OFF
 SSB-OFF
 RAD/PH-RAD.

7. I.F. Alignment (455 kc. I.F. with BAND SWITCH in Band 540kc-1.4 mc.).
 a) Feed the 455 kc. output of the Harvey Radio Labs Model 46 sweep generator into the signal grid of V3 (pin 1). CRYSTAL SEL. SW. should be in the 2kc position. Observe output waveform on the detector load (junction of R 58 and R 60). ~~Adjust T 8, 7, 6, 120, & T 5, 4 for maximum output as observed on the scope, peak T 8, 7, 6, 120, & T 5, 4.~~ For maximum output as observed on the scope, peak T 8, 7, 6, 120, & T 5, 4. in this order as many times as is necessary for optimum response. CRYSTAL PHASING CONTROL must be at zero for this alignment. Check relation of this control with condenser setting. With control on zero, condenser should be half open.
- c) When the above alignment has been completed vary the CRYSTAL PHASING CONTROL clockwise and counterclockwise about the zero position and observe waveform on the scope. The rejection notch should move above and below the frequency of the series resonance peak. Compare with response curves.
- d) Put CRYSTAL PHASING CONTROL in the zero position and observe the waveforms for all positions of the CRYSTAL SELECTIVITY SWITCH. Compare with response curves.

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- e) Feed a Measurements 65-B or 82 signal generator into pin 1 of V 3 and measure the 6 db. bandwidths of all positions of the CRYSTAL SEL. SW. The following results should be obtained: (CRYSTAL PHASING control at zero)

Non-Crystal	7000 CPS
2 KC.	2000 "
1.5 KC.	1500 "
1 KC.	1000 "
.5 KC.	500 "
.25 KC.	250 "
1000 cps, 30% mod.	

- f) Measure the 455kc input in the NON CRYSTAL position to produce 17.3 v. rms across the 600 Ω load (should be 25-30 μ v.).

8. I.F. Alignment See Addendum

10. R.F. Alignment (Bandsread and Antenna Tuning Capacity at minimum capacity and osc. trim. open

- △
- a) Set the MAIN TUNING condenser and dial at the top end of the band. See alignment chart below. 75 μ
 - b) Feed into the ANTENNA terminals through an appropriate matching network from a Measurements 82 or 65 *B signal generator a frequency corresponding to the high end of band alignment frequency. Tune oscillator slug for maximum audio output. Adjust the corresponding R.F. trimmer for maximum audio output.
 - c) Set the MAIN TUNING condenser and dial at the low end of band calibrating frequency. Feed in an R.F. signal corresponding to this. Adjust oscillator, R.F. and Antenna tuning slugs for maximum output.
 - d) Repeat (b) and (c) as many times as necessary for optimum output. In repeating (b) adjust the oscillator trimmer instead of the tuning slug. i.e. adjust trimmers at high end of band and slugs at low end of band.
 - * e) Measure the R.F. input at several points in the band for 17.3 v. rms across the 600 Ω load.
 - * f) Check the dial calibration at several points in the band.
 - * g) Check the 10 db. noise figure at several points in the band.
 - * h) Check the image rejection at several points in the band
 - i) Repeat (a) - (h) for all bands.

ALIGNMENT CHART

Band	High End	Low End
1	1450 kc.	540 kc.
2	3.3 mc.	1.43 mc.
3	5.6 mc.	3.2 mc.
4	9.0 mc.	5.8 mc.
5	17.0 mc.	10.0 mc.
6	31.0 mc.	18.0 mc.

CRYSTAL SEL. - NON CXTL

- * P ak ANTENNA TUNE capacity before each measurement. Compare results with standard charts.

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11. Check the BANDSPREAD dial calibration in several places throughout each band.

9. B.F.O. Operation

- a) Check B.F.O. Switch action. Switch ON-V 13 plate voltage is on. Switch OFF-V 13 plate voltage is off.
- b) Set B.F.O. PITCH CONTROL on zero (condenser should be half open).
- c) Feed an R.F. Signal Generator set at 455KC. into pin 1, V 6.
- d) With B.F.O. SWITCH ON, adjust the B.F.O. tuning slug L22 so that the BFO zero beats with the incoming 455KC. signal. The zero beating may be ascertained by means of earphones or a speaker.
- e) Set the BFO PITCH control at - 3 KC. and observe that it now takes an input of 452 KC. to zero beat.
- f) Set the BFO PITCH control at + 3 KC. and observe that it now takes an input of 458 KC. to zero beat.

12. SEND-RECEIVE SWITCH Operation

- a) Switch in RECEIVE position- Receiver should operate.
- b) Switch in SEND position- Receiver is disabled and B+ is removed from V1 thru V7.

13. AVC SWITCH Operation

- a) With AVC ON- Tune in a station.
- b) With AVC OFF- Notice volume decrease.
- c) With AVC ON check a few points on the AVC characteristic curves.

14. NOISE LIMITER SWITCH Operation

With N.L. SW.-OFF

- a) Feed any 1000 cps 30 % modulated R.F. signal into the Antenna Terminals. and observe waveform on the output 600 Ω load resistor. Then radiate a source of noise pulses from a vibrator power supply into the receiver. Observe noise pulses in output waveform. Then throw N.L. Sw.-ON and observe the disappearance of the noise pulses without distorting the sinewave output.

15. RELAY TERMINALS

- a) With SEND-RECEIVE SWITCH on SEND, reception should take place only when the RELAY TERMINALS are shorted.

16. S METER CALIBRATION

- a) With no R.F. signal input, R.F. GAIN control full on, adjust R 50 until S-Meter reads zero S units.

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- 75Ω
- b) Feed a 50 μvolt R.F. signal into the Antenna Terminals. Tune receiver for maximum reading on the S-Meter. Meter should read S-9. AVC SWITCH should be ON. Check a few other points on S-Meter Calibration Chart. Use proper matching pad between the signal generator and the receiver.
17. AUDIO GAIN CONTROL
- a) Check clockwise rotation for maximum volume.
18. R.F. GAIN CONTROL
- a) Check clockwise rotation for maximum volume.
19. PHONE JACK
- a) Plug in earphones and hear reception. Speaker should disable.
20. AUDIO OUTPUT TERMINALS & PHONO INPUT JACK
- a) Feed a 1000 cps audio signal into the PHONO INPUT JACK, (RADIO PHONO SWITCH in the PHONO position, AUDIO SEL. SW. in NORMAL, AUDIO GAIN on full) of sufficient magnitude to give 34.6 v.a.c. across the 600 Ω load resistor on the 600 Ω OUTPUT TERMINALS. Then read the a.c. voltage on the following terminals:
- | | |
|--------|--------------------|
| 16 Ω - | <u>5.65</u> v.a.c. |
| 8 Ω - | <u>4</u> v.a.c. |
| 4 Ω - | <u>2.82</u> v.a.c. |
21. SINGLE SIDE BAND SWITCH & I.F. OUT JACK
- a) Feed into Antenna Terminals (75Ω) a 10 μvolt signal at 11.9 mc Listen or measure audio output of receiver. Then switch SSB SWITCH from OFF to ON and observe audio to cease. Measure 4.6 v.a.c. on the I.F. OUT JACK using the HP 410 B VTVM.
22. ANTENNA TERMINALS
- a) Measure the R.F. sensitivity of the finished receiver at any frequency thru the 75 Ω ANTENNA TERMINALS. (Use the 75Ω pad between the signal generator and the receiver). Then measure the R.F. sensitivity thru the 300 Ω terminals (Use the 75 Ω pad again). The difference in sensitivities should be 30V at 18 Mc.
23. AC UTILITY SOCKET
- a) Measure 115 v.a.c. across these terminals.
24. ACCESSORY SOCKET
- a) Measure ground on pins 4 & 5.
b) Measure +250 v.d.c. on pin 8.
c) Measure 6.3 V.a.c. on pin 2.

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25. SPURIOUS BEATS

- a). Turn BFO ON and tune through each band listening for spurious beats. R.F. GAIN & AUDIO GAIN controls should be at maximum. ANTENNA TERMINALS should be grounded. There should be no beats of appreciable magnitude which are audible.

26. LISTENING TEST

- a). Put an outside antenna on the ANTENNA TERMINALS of the receiver and listen in on all bands throughout the range. Use all controls on front panel and observe effect.

ADDENDUM

8. I.F. alignment 3.955 Mc. Bandswitch in band 5.4 - 9.6 Mc.

a). Align 3.5 Mc Oscillator

1. Connect D.C. VTVM to green terminal on L19
2. Tune L19 for peak on meter.

b). Align 3.955 Mc. I.F.

1. Connect R.F. generator to pin #1, V3
2. Connect D.C. VTVM to junction of R59 and R60.
3. Set selectivity control in 2.0 Mc. position, phase control at 0 position.
4. Tune generator to obtain peak on meter. This should be at 3.955 Mc.
5. Tune each slug on T2 and T3 in from minimum inductance position and stop as soon as peak is reached.
6. The input required to produce 17.3 V.R.M.S. across 600 ohm output load should be approximately 35 uv.

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GPR-90 RX TEST PROCEDURE

1. HFO switch check - Check continuity between xtal sockets and switch positions.
2. Insert crystals in sockets as shown on test data sheet.
3. Tuning -
 - a. Select crystal.
 - b. Tune receiver to desired signal frequency.
 - c. Tune generator to obtain maximum output of receiver.
 - d. Place HFO switch in variable position and tune receiver to obtain maximum output.
 - e. Place HFO switch in xtal position and take sensitivity and signal to noise ratio.
 - f. Place HFO switch in External position. Connect another signal generator to the External socket. Set input to 1 volt and tune it to the HF oscillator frequency. Take sensitivity and signal to noise ratio.

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PERFORMANCE DATA

RADIO RECEIVER GPR-90

Serial No. _____

Power Source: 115 Volts, 60 cycles AC.

Standard Output: 2 watt (34.6 volts) across 600 ohm load.
 .35 volt across 2nd Detector Load.

Dummy Antenna: 75 ohms.

HF Oscillator Above Signal Frequency On All Bands.

IF SENSITIVITY AT MIXER GRID FOR .35 AC ACROSS DETECTOR LOAD.

Control Settings

Bandsread Locked at 100 Log.

- Main Tuning Dial - Gang Half Open
- HF Gain - Max
- Audio Gain - Max
- AVC - Off
- Send-Receive SW - Receive
- Audio Selector - Normal
- BFO - Off
- Radio-Phono - Radio
- SSB SW - Off
- Noise Limiter - Off

BAND 1	455 KC	30% Mod. at 1,000 cycles	Non-Xtal _____	uv.
BAND 1	455 KC	30% Mod. at 1,000 cycles	2 KC Xtal _____	uv.
BAND 1	455 KC	30% Mod. at 100 cycles	.5 KC Xtal _____	uv.
BAND 4	3.955 MC	30% Mod. at 1,000 cycles	Non-Xtal _____	uv.

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IF BANDWIDTH - MIXER GRID

BAND 1 455 KC Mod. 30% at 1,000 cycles.
 400 cycles. *
 100 cycles. **

BANDWIDTH CONTROL SETTING	6DB	60DB
** .25 KC (Xtal Phase-0) ** .5 KC (Xtal Phase-0) * 1.0 KC (Xtal Phase-0) * 1.5 KC (Xtal Phase-0) 2.0 KC (Xtal Phase-0) Non-Xtal		

BFO

+ _____ cps

= _____ cps

SSB OUTPUT _____

SSB SWITCH _____

AVC _____

S-METER ADJ _____

SEND-RECEIVE _____

RELAY _____

NOISE LIMITER _____

PHONES _____

HUM-RADIO _____ PHONO _____

DISTORTION _____

DIAL LOCK _____

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SPEAKER 4 OHMS (.4V) 8 OHMS (.6V) 16 OHMS (.8V) 600 OHMS (.4V)

UTILITY SOCKET _____

B+ _____

Reg. B+ _____

PHONO _____ 2 watts Power Output: Audio Input _____ Volts.

AUDIO SELECTOR _____ Normal

_____ Low Pass

_____ 1200 Cycles Peak

AUDIO SPREAD

NARROW 10 DB BW _____

BROAD 10 DB BW _____

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BAND	FREQ. MGS.	MICROVOLT INPUT FOR .35 ACROSS DET. LOAD	MICROVOLT INPUT FOR 10 DB SIGNAL TO NOISE RATIO	IMAGE RATIO	MAX. FREQ. ERROR
1	.56				
	1.60				
	1.40				
2	1.50				
	2.40				
	3.20				
3	3.30				
	4.40				
	5.50				
4	5.60				
	7.40				
	9.50				
5	9.80				
	13.50				
	17.5				
6	18.0				
	24.0				
	31.0				

Check for Beats at 7.0 MC and 10.5 MC _____.

Check for Beats at 1.82 MC, 2.275 MC, 2.73 MC, 3.18 MC, 3.64 MC. _____.

Intermodulation at 5.0 MC + .880 MC + = 5.88 MC. _____ DB.

300 Ohms Ant nna _____.

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BANDSPREAD

AMATEUR BAND	MAIN TUNING DIAL CHECK POINTS	BANDSPREAD DIAL CHECK POINTS	MAX. FREQUENCY ERROR
160 M	2.0 MC	Every 100 KC	
80 M	4.1 MC	Every 100 KC	
40 M	7.4 MC	Every 100 KC	
20 M	14.5 MC	Every 100 KC	
15 M	21.8 MC	Every 100 KC	
10-11 M			

PERFORMANCE DATA

GPR-90 RX

SIGNAL FREQUENCY	XTAL SOCKET	XTAL FREQUENCY	MODE	SENSITIVITY	S/N
30.045	3	17	Xtal		
			Ext.		
16.045	4	20	Xtal		
			Ext.		
9.045	5	13	Xtal		
			Ext.		
4.545	8	5	Xtal		
			Ext.		
3.045	9	3.5	Xtal		
			Ext.		
0.995	10	1.35	Xtal		
			Ext.		

AIR TEST _____

DATE _____

TESTED BY _____

TMC Form 152

